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N.H. Nagiyev[1], Sh.Sh. Gahramanova[1], İ.A. İsbatov[2]

[1]Azerbaijan University of Architecture and Construction,
Azerbaijan, Baku, A. Sultanova str., 11, Az1073
[2]Azerbaijan, Baku, Baku State Design İnstitute, Istiqlaliyyat str., 31, Az1001
e-mail: memarliq@azmiu.edu.az, shahlakahramanova@yandex.ru, giprogor@azdata.ne

PROBLEMS OF EFFECTIVE LAND USE AND ENVIRONMENTAL PLANNING IN CITIES: THE CASE-STUDY OF BAKU

Abstract: *Urban environment is a dynamic system of interrelated elements which is adabtable to the evolution of human needs and aspirations. It includes natural and man-made factors, which should provide ecological balance and determine the living conditions. Urban development implies the use of significant areas and thereby it affects the transformation of the environment. This paper focuses on research of methods of effective land use control through urban planning to increase longetivety and life quality in cities and suburbs. Understanding environmental problems is key to effective planning of land use. Urban growth leads to increasing of technogeneous loading on areas and land degradation. As a result, the quality and longetivity of life falls down. On the other hand, the increase in number of people in cities and the reduction of lands require a more intensive land use. Where is the red line? This paper will highlight some of key findings in recent researches, which show how economic and social aspects are connected to effective land use control through urban planning to increase life quality in cities and suburbs. The paper will then suggest how urban development of Baku and its suburbs can be adapted to adress the research findings. The method allows determining an optimal strategy of effective land-use and environmental planning in cities. These findings can be applied in design process of Baku development, as well as other cities of Azerbaijan.*

Keywords: *effective land use, environmental planning, Baku, urban planning, economic and social aspects, life quality.*

Introduction

The urban environment includes natural and man-made factors that have to ensure ecological balance and to determine the life conditions. The main natural factors of the urban environment affecting the life quality of individuals are air, soil and subsoil, water, flora, fauna, and nature monuments.

Man-made environmental factors can be grouped into two broad categories: elements of the superstructure, including all buildings for various purposes and elements of infrastructure, including mainly engineering network of municipal improvement, transport and telecommunication network.

The component elements of the environment are mutually conditioned: natural conditions with artificial ones, and infrastructure elements with elements of superstructure. Hereupon, the impact on one of the main elements of urban environment can lead to changes in the other component elements.

Land-use planning is a significant factor in land-use and environmental planning through consensual spatial allocation and solution of specific city functions. Effective land-use planning is based on the differentiated use of land and natural conditions in order to meet different categories of human activities, in optimal conditions of functionality, economy and comfort; at the same time, it aims to create the most suitable living conditions for the development of social relations, as well as the growth of the cultural and aesthetic level of individuals. Therefore, when

organizing the urban environment, it is necessary to take into account trends and new urban elements that contribute to improving the life quality in modern society.

The most important urban factors generating profound changes in urban environment are:

- enhanced development of productive forces as a result of scientific and technical progress and efficient use of natural resources;
- continuous growth of the cultural level of residents of populated areas;
- increase in urbanization degree as a result of development of productive forces and population growth;
- improvement of urban comfort;
- increase in mobility of the population;
- development of functions related to the rational use of free time.

Urban development presupposes the use of large areas and strongly affects the transformation of the environment. This makes it necessary to constantly monitor factors that can change the relatively stable ecological balance.

In these conditions, a rational economic use of urban and suburban areas is a major part of activities for protection of the environment and use of natural resources for vital needs of individuals and society. These issues are particularly relevant for the capital of Azerbaijan – the city of Baku, where there are almost no vacant territories for the city growth. Environmental problems associated with high rates of urbanization have also exacerbated here during last years. About 40% of the total population of Azerbaijan is concentrated here (Gahramanova Sh., Babayev Sh., 2017). The city with surrounding landscapes is one of the hot spots in the Caspian region. (Gahramanova, 2012; Gahramanova, 2011)

Avoidance of inefficient land use in the framework of urban development has a great value from many points of view: economic, functional and social (Nagiyev, 2012). Thus, the preservation of agricultural plots and, in particular, high-quality plots, as well as the preservation of forest resources is an economic objective of the first importance. At the same time, the concentration of urban functions in a rational range allows to make significant savings particularly in connection with urban engineering accomplishment of territory, from the point of view of investment and operating costs.

From a functional point of view, economical use of the territory for different urban zones is the undeniable advantage (Jianguo Wu, 2014). For example, reducing the distance between the components of the city, combining and cooperating different zones contribute to the improvement of some economic functions and functions of cultural and consumer services, etc.

The above-mentioned benefits of rational use of urban and suburban areas are combined with other social considerations, such as those relating to the protection of the environment and the conservation of natural resources for future generations.

Methodology

This paper focuses on research of the methods for effective land use control through urban planning to increase longetivety and life quality in cities and suburbs.

The method consists of theoretical assumption and methods of investigation. Methodology involves theoretical questions that guide the directions of collecting and analyzing literature/data/information and quality perspectives at different stages of the Azerbaijan cities urbanization.

It includes:

- analysis of key findings in recent researches, which show how economic and social aspects are connected to effective land use control through urban planning to increase life quality in cities and suburbs;
- investigation of some archive materials (old photos, documentary films, articles in newspapers, etc.) to understand the construction and evolution of Azerbaijan cities, especially the city of Baku since 1870s;

- collecting and analyzing master plans and urban development documents of the cities and towns of Azerbaijan (Baku, Ganja, Sumgait, etc.), consultations with Baku State Design Institute and Azerbaijan State Design institute to perceive the structure and dynamics of the cities (and to understand the impact of social, economic and functional aspects on effective land use and environmental planning in urban and suburban areas;
- studying relevant literature (articles, books), which represent a process of city growth and ecological problems, economic and social aspects of urban development in Azerbaijan cities;
- analysis of National Urban Design Regulations (since 1960s) and their implementation in planning structure of the cities in Azerbaijan;

Measurement and analysis

Depending on the last experience, methods of solving urban development problems should be periodically reviewed in accordance with the new requirements of economic, social, scientific and technological progress.

In this regard, some activities have been implemented in the Republic of Azerbaijan since 2000, while others are currently being implemented. The urban planning measures carried out in Baku have a special place in this regards. The most important among these activities are:

- the urban planning law;
- the draw law focused on protection of the environment;
- the draft regulation focused on building density in residential areas;
- the industrial zones development Design standards & Guidelines;
- the draft urban transport development regulation;
- guidelines of the Ministry of Health related to maximum permissible concentration of harmful substances.

These materials are based on scientific papers and studies related to the main aspects that have been carried out within the framework of specialized research and design organizations. Other similar materials are also being reviewed (Jennifer R. Wolch, Jason Byrne, Joshua P. Newell, 2014). The researches on various urban issues are carried out (Batty, 2010; Manson, S & O'Sullivan, D, 2006).

1. Economic and functional aspects, related to land use and organization of urban environment

On the basis of these researches, as well as the analysis of experience in the field of design and implementation of urban development programs in the big cities Azerbaijan, including Baku (Fig.1), Sumgait and Ganja, it is possible to draw some conclusions about the method of land use and improvement of the environment in the cities and suburbs. In this way three types of links should be considered:

- links within urban functional zones;
- links between separate functional zones;
- links between city and its suburban area.

1.1. The links within the functional zones and elements. Allocation of the city area into zones refers to the predominant feature, as in most cases urban areas have the integrated structure, which includes a lot of complementary functions. Baku is a multifunctional city, it is the administrative, cultural, educational, financial and transport center of the country, that is undoubtedly reflected in the complexity of the planning structure (Fig.2).

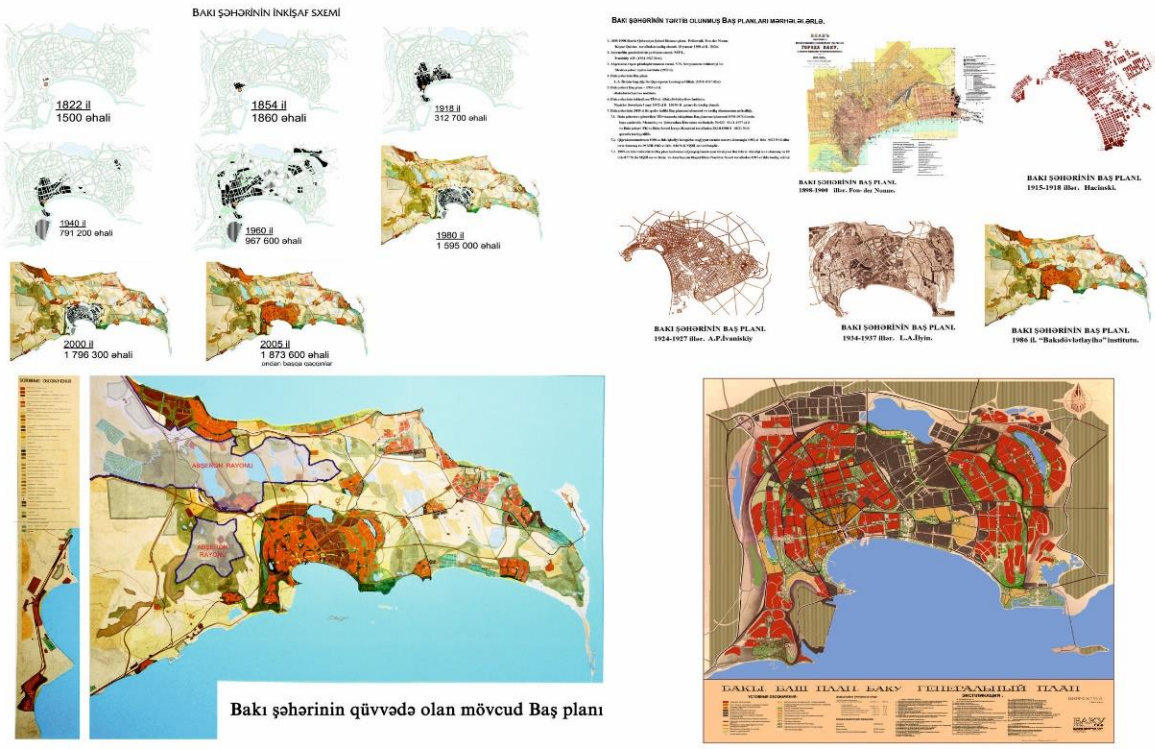

Figure 1. Image caption

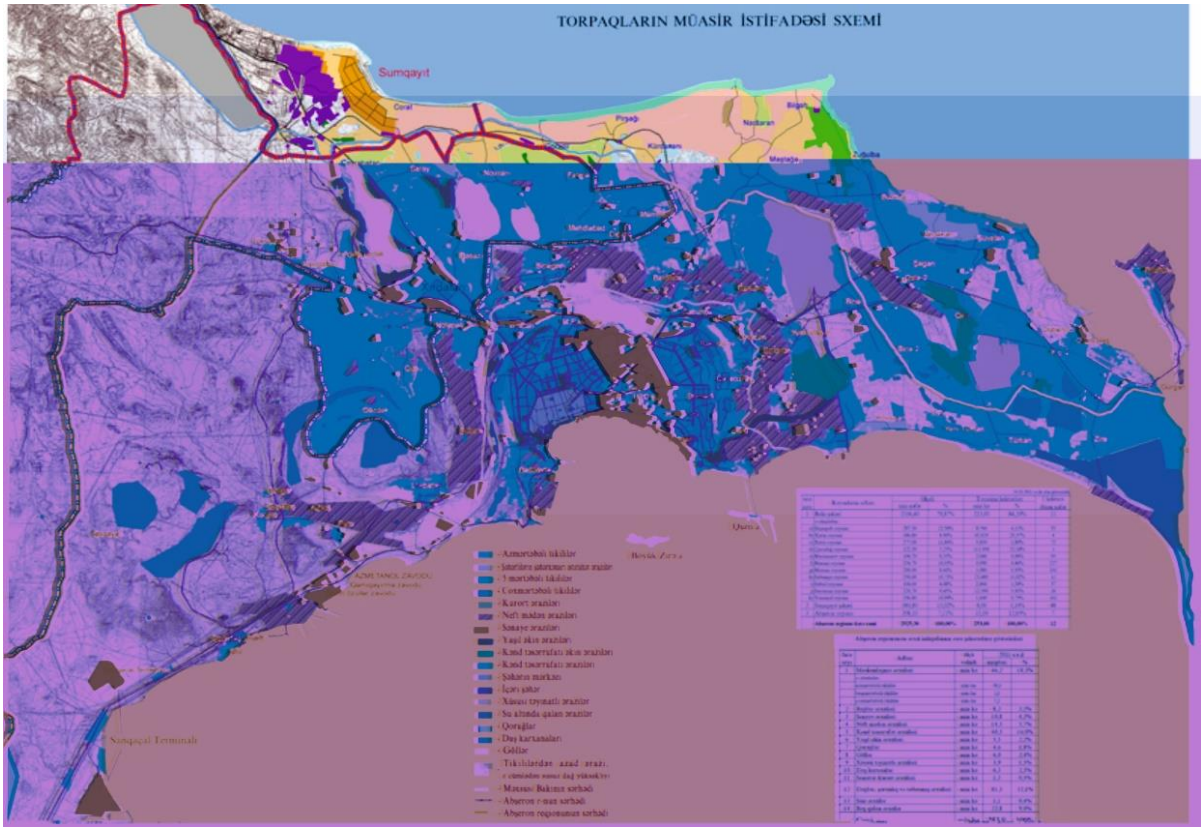

Figure 2. Current land use plan of Baku

Regarding the organization of residential areas, it can be argued that the principle of integrated housing units with a hierarchy in several levels is the most appropriate in many

respects. In this sense, it is necessary to note the effective land use and the possibility of acceptable living condition organization, which is directly related to the topic we are addressing. The implementation of urban ensembles on the basis of the principle of integrated residential units allows the application of appropriate functional and economic solutions, as well as realization of a significant diversity of spatial composition. The authors think that the negative aspects observed in some cases are the consequence of design or construction errors.

The positive results obtained due to the residential zone organization based on the principle of integrated urban development units can be explained by the system flexibility, as well as the possibility to combine areas intended for different functions: concentration of green spaces and sports grounds, increasing the capacity of cultural and household buildings, etc.

The placement of some harmless production facilities within residential complexes can contribute to the economic efficiency and effectiveness of the territory. Examples include confectionery and biscuit factories, carpet workshops, garment factories, wineries, craft shops, printing, packaging and newspaper industry buildings in the planning structure of Baku.

A significant territorial reserve within the city border is a zone with a low building density or rural areas, the restructuring of which can significantly contribute to the economy of agricultural lands. A detailed analysis of these zones should be carried out and the feasibility of their restructuring should be determined in the context of high economic and social efficiency. In this regard, one would to separately emphasize the pilot projects currently being developed to transform low-rise low-density home-stead type of houses in Sabail, Narimanov, Khatai, Nizami, Surakhani and Yasamal districts of Baku. As a result, 1094 houses (893 thousand m^2, 15857 apartments) will be demolished and 254 tower residential buildings for 49614 residents will be built.

Grouping of industrial production and warehouses in the form of compact industrial zones and technoparks presents significant functional and economic advantages and makes it possible to effectively use the lands. Likewise the residential zone, grouping of industrial zones are provided by a well-organized cooperation of industries, the appropriate placement of industrial enterprises, the elimination of harmful effects, etc. Over the recent years, there has been a reorganization of industrial zones in the city of Baku, where old oil refineries and other industrial enterprises are removed outside the city to Alat settlement. In other cities of Azerbaijan (Sumgait, Neftchala, Mingachevir) technological parks are being created with new industrial infrastructure.

Despite this, there are many examples of inappropriate land use in industrial zones due to non-compliance with the above conditions or for other reasons, such as: the introduction of inappropriate technologies, improper storage of waste, etc.

To avoid the inefficient land use in industrial zones, special attention should be paid to the study of industrial development at subsequent stages. At each stage, it is necessary to monitor the land use in order to avoid agricultural land uptake.

The disadvantages of environmental management and operation of industrial zones, leading to inefficient land use and land uptake, are usually the result of the incorrect concept of the developed projects. Thus, the poor environmental situation around Sumgait for many years was due to the incorrect location of industrial and residential areas in relation to the prevailing winds, as well as imperfection of technological equipment and inconsistency of production.

In this regard, it is often overlooked that industrial zones should be holistic bodies and their component elements should be integrated into a common ensemble in view of the concentration and co-operation of some functions. In other words, these zones should not just be attached production units or independent storage areas. To implement this provision, it is necessary to develop a General concept of the industrial profile of each city or each settlement system separately, that will serve as the basis of the industrial zones organization. Urban development projects at the territorial level, as well as planning of housing estates, should include different variants of industries placing depending on local characteristics and on the General Development Concept. That is why the organization of the environment and the effective land use of the

territory within industrial zones should be analyzed at all planning stages and levels, especially at territorial and urban planning levels.

Planning projects create preconditions for the appropriate distribution of all industrial production in the territory of cities for their grouping within industrial zones depending on the degree and nature of their hazards, technological process, needs for various uses, stages of implementation, etc. The organization of production units within the industrial zones will allow to observe environmental protection conditions and to realize considerable savings by combining in the limited territory and joint use of constructions and urban networks.

Motorized traffic is one of the main sources of pollution in contemporary cities. The main harmful effects of motorized traffic are toxic emissions and noise. The analysis of statistical data revealed that the share of motor transport in Baku atmospheric pollution increased by 7 times from 2000 to 2016. Increase in the number of vehicles by 1.2 million cars over the period had contributed to this. 94.7% of all vehicles in Absheron peninsula is concentrated in Baku. Transport environment creates a significant share of noise in Baku.

In addition to these harmful effects, motorized traffic also contributes to the disruption of the function of the city central zones.

The another very important aspect from the point of view of our research topic is that the continuous development of motorized traffic leads to the occupation of large areas for the development of highways and road network, car parking and garages.

These problems certainly do not deplete the various aspects of traffic and its impact on the urban environment. Based on the statement of the negative effects of motorized traffic on the environment quality and the occupation of large areas, we will further consider some urban development opportunities to limit or partially correct these harmful effects. These urban development methods are based on the experience gained in the Republic of Azerbaijan.

The first set of measures relates to the limitation of vehicular traffic within the framework of the Master Plan of the city in various ways: by the most uniform distribution of the traffic within the city and, thus, by avoiding concentration of polarizing movement of objects; by implementation of the most direct links between the functional areas (Fig.3).

Figure 3. Organization of the transportation system in the city of Baku

The second set of measures addresses the differentiation and strict classification of highways by traffic intensity and movement character and the appropriate improvement of these highways. Taking into account this differentiation will allow the uniform organization of movement and implementation of actions for environment protection. This category of activities also includes

the setbacks of the building line, appropriate improvement of intersections and traffic junctions, separation of highways from pedestrian traffic (especially in housing estates), as well as the full removal of traffic from some urban districts (especially from central zone and shopping areas, etc.).

The third set of measures refers to the organization of an effective public transport system that is able to take up a large part of the population movement. It will reduce a passenger car movement and will result in the dispersion of traffic on the main highways and traffic junctions.

The current national regulations provide for different areas for construction of car parking and garages depending on the city size, specific features of functional areas, distances to the institutions, etc. There are also the minimal setbacks of residential and cultural buildings from the building line here, depending on the capacity of car parking or garages.

At maximum possible rate of motorization, it is impractical and burdensome to reserve territories for the placement of car parking on the ground. In excess of normative indexes of motorization, it is possible to arrange car parking places above or underground.

The above-mentioned urban measures do not fully resolve the issues related to the harmful effects of transport. They need to be supplemented by numerous, specific conditions, as well as various by non-urban development activities (car design improvement, traffic regulation, etc.). All these measures in general can significantly contribute to the reduction of pollution, improvement of the environment, the implementation of effective land use. These steps also present an opportunity to enhance the sustainability of urban areas and to increase benefits to individuals, among others, reduced costs, increased living comfort and improved health.

One of the effective ways to improve the urban environment is the enhancement of green spaces, ponds, sports fields and playgrounds. The current national regulations generally provide for the expansion of these improvements, depending on current and future needs and taking into account the profile and size of the settlement. Green spaces, sports grounds and playgrounds intended for entertainment in city districts, in addition to functional and aesthetic role, greatly contribute to improving the climate and hence the increase in such areas is highly desirable.

It was revealed that initially the absence of large forest park zones on the Absheron Peninsula was caused by unfavorable natural and climatic factors (arid climate, strong north winds, primitive eroded gray-earth and salty soils, etc.). As a result of fruitful efforts, the green areas were increased more than 5,000 times and reached 15,000 hectares in 1880-1992. In the subsequent period, the area of parks and squares was halved as a result of the intensive construction and the implementation of large-scale infrastructure projects in Baku. Over the recent years, landscaping work to restore the green cover of Baku has been carried out (Fig.4). However, there is a need to create large forested areas here.

Figure 4. Project of the green cover restoration in the central part of Baku

At the same time, it is necessary to take into account the possibility of appropriate accomplishment and maintenance of plantings and subsistence farms (greenhouses, seed plots, experimental stations for acclimatization of some plants, etc.), as well as the increased cost of these works.

Consequently, when determining the size of the areas necessary for green spaces, sports grounds and entertainment in general, it is necessary to comply with regulatory limits, so that it is possible to perform qualitative works which, in turn, contributes to improving the urban environment.

It is also necessary note some urban planning techniques that can increase the effectiveness of green spaces: concentration of green spaces in small areas, coordination of the system of green spaces with the city master plan, inclusion of green spaces into the local landscape, linkage of a planting system and with the conditions of microclimate, etc. In view of this, it is necessary to make effective land use in slopes, basins, areas with a high level of groundwater and other unsuitable for urban development lands, which, due to the improvement of green spaces or water basins, can contribute to improving the urban environment.

Summing up the above, it should be emphasized that improving the urban environment quality by accomplishment of green spaces, sports and playgrounds, contradicts the economy in general and the rational land use in particular. In fact, these factors are interlinked at the level of each locality.

1.2. Links between separate functional areas

From the point of view of the research topic, the linkages between residential and industrial areas are of particular importance. In the following, we will limit ourselves to this major task, given that some aspects of the linkages between functional urban areas derive from the joint analysis of the other elements we have discussed above.

Activities under the process of material goods production and especially the industrial activity is the most important polluting factor. The harmful effects of these activities affect all components of the environment and particularly the environment of human settlements. The actions taken so far to prevent and eliminate these impacts have produced only partial results. The technical means to neutralize the hazards near the source have proved largely ineffective and are too expensive in relation to the total amount of production costs.

Referring to the situation, the planning activity provides for protective distance between residential and industrial areas depending on the area of harmful substances spread. This action has a passive character and has led to agricultural land uptake, or even degradation of large areas and, in some cases, it does not provide complete elimination of harmful impacts on residential areas.

In addition to the considerable losses caused to agriculture, the increase in distances between residential and industrial areas leads to extending the motorways, urban networks and, thereby, and results in increased costs of capital investment and maintenance.

There are also some indirect, additional costs caused by the difficulties of cooperative arrangements between industry and city. Comparing the two methods used to protect the environment of cities, the superiority of the method for elimination of hazards near the source has become evident. Currently, the technical capacities for the complete elimination of pollutions were not sufficiently developed for all industries, and their cost is high. We still believe that this task has not been given attention corresponding to the importance of the issue of environmental protection. Calculations of complex economic efficiency, produced for some industries, have demonstrated the feasibility of using the advanced technical methods of environmental protection and, thereby, their usefulness for effective lands use and even the recovery of some products.

We are confident that the priority measures undertaken over the past few years to protect the environment, which are planned to be implemented in the Republic of Azerbaijan, will lead to the

development of researches and to the improvement of the necessary technical means in rational economic conditions.

It is necessary to develop special researches to determine the degree of pollutions concentration and establishment of science-based protection measures for the environment protection. In this regard, the overall effect of various harmful factors should be taken into account, bearing in mind the geographical conditions, microclimate, etc.

Therefore, the development of scientific research and introduction of advanced technology for the environmental protection will lead to the improvement of the living conditions in the cities as well as to the rational use of the territory.

1.3. Links between cities and suburbs

The correct organization of the urban environment cannot be allowed without appropriate coordination with the urban development of suburbs. There are numerous urban functions in this area, which are deeply intertwined and connected with the specific functions of adjacent settlements.

In view of this, areas for development of urban functions in the suburbs should be reserved and functional cooperation within the settling system must be organized. In this context, we deem it is necessary to accord special priority to the following matters:

- organization of industrial zones at the territorial level;
- location of the labour force;
- food products supply;
- improvement of recreation territories;
- traffic and public transportation management in human settlements system.

In 2017, the Regional Plan for the Development of Greater Baku was completed. It includes three administrative units (Baku, Sumgait, Khirdalan) with surrounding settlements and actually covers the all Absheron Peninsula. This document allows to organize planning decisions at a larger territorial level, taking into account suburban areas (Fig.5).

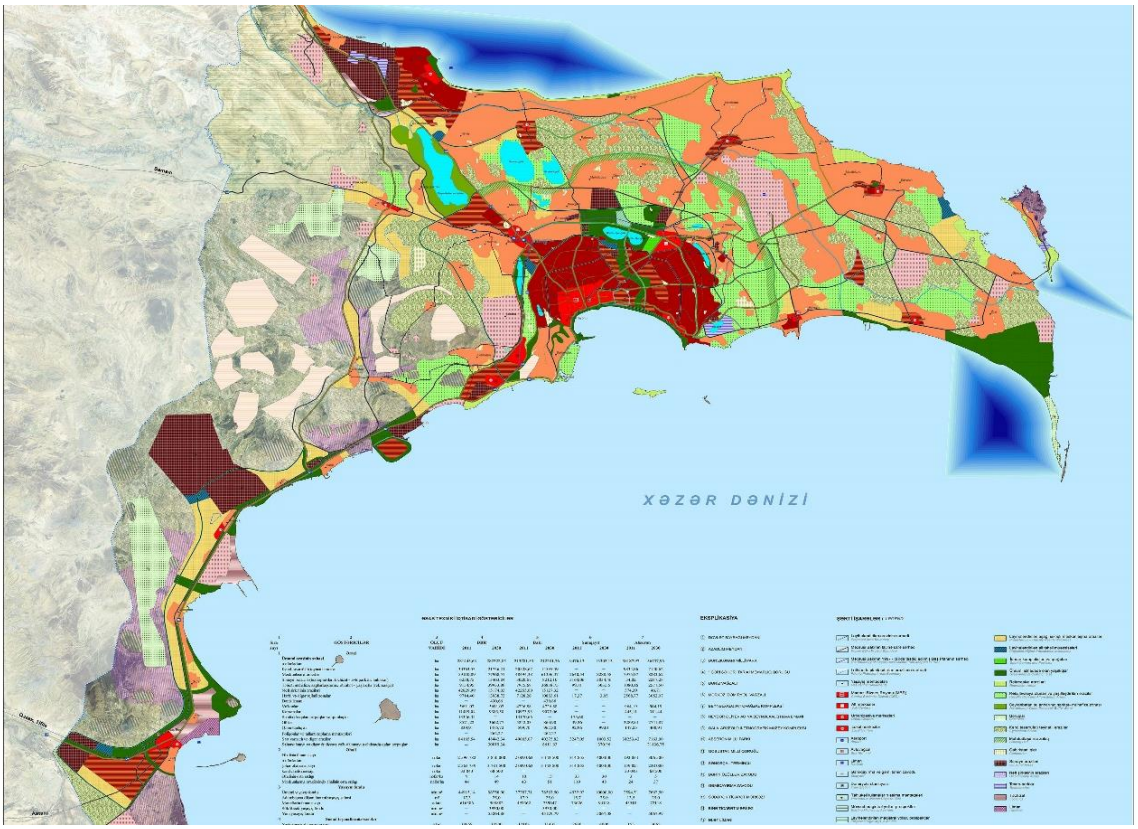

Figure 5. Greater Baku Regional Development Plan (2017)

Economic and functional aspects, concerning the land use and environmental protection in the territories and functions mentioned above, are similar to the aspects of urban area and, therefore, are not needed anymore. We should also note some negative issues arising from the inconsistency of these tasks in suburbs. For example, placing some harmful objects in suburban areas without adequate measures to reduce their harmfulness and to protect the environment, after a while can lead to the same negative consequences of functional and economic nature, as with the urban environment or even more.

The similar negative phenomena may occur in organizing residential areas in suburbs. Thus, for example, in some cases single-storey houses, surrounded by large plots, with an inadequate level of technical equipment, in close proximity to the city are built. This leads to large land uptake from natural and semi-natural land, to worsening of inter-urban traffic, as well as to the disruption of other functions of semi-urban areas.

Coordination of specific functions in peri-urban area, establishment of effective control over the land use and compliance with measures to control pollution create prerequisites for the development of recreation and tourism zones.

2. Social aspects concerning the relationship between environmental quality and effective urban land use

It follows from the above that from a functional and economic point of view, the effective land use is not contrary to the requirements for the urban environment improvement. Moreover, it can be argued that the appropriate land use in urban and suburban areas is a prerequisite for the environmental protection and, at the same time, meets the functional and economic requirements for modern urban planning.

Nevertheless, the special social importance of the rational land use for urban environment protection should be emphasized.

The enhanced development of productive forces in modern conditions in many countries and, in particular, the development of industrial production and the continuous growth of urbanization determines the rapid transformation of the environment and affect the living conditions. The effects of this transformation are being felt in the environment of cities that populations have to adapt to these changes constantly. In this context, urban planners will have to organize the urban environment within the limits of human adaptability.

The spatial organization of the urban environment should simultaneously ensure the development of community life. This includes ongoing growth of the material and spiritual life of the people.

Improvement the life comfort, provided in the various stages of forecasting, the comprehensive development of the urban life quality should be provided for all residents of cities and regions of the country.

Urban planners should pay special attention to the most intensive land use to promote the integrated provision of urban infrastructure and to protect the urban environment for the present and future generations. In this context, there is a need to improve practical measures and to promote scientific research in this area, as well as to establish strict mechanism for urban planning solutions at all levels and to continue legislative measures in the area of urban and rural planning.

Conclusion

To return to the research problem, what is the ways of effective land use and environmental planning in cities? On the basis of the key findings in the recent researches, collecting and analyzing literature/data/information, as well as urban development documents concerning cities and towns of Azerbaijan, we can note three main aspects (economic, functional and social), related to land-use and organization of environment. The analysis of some urban development activities in big cities of Azerbaijan confirmed the correctness of the implemented land use and

environmental planning methods. These findings can be applied in design process of development of the city of Baku and other cities of Azerbaijan.

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